REMARKS

Claims 1, 2, 6-21 and 136 are presently pending in the subject application and have not been changed with respect to their immediate prior version. A listing of the claims is being provided with this Response for ease of reference for the Examiner.

Claims 1, 2, 4-21 and 136 have been previously examined. Claims 1, 2, 4-14, 16-21 and 136 stand rejected, and claim 15 is objected to as depending upon a rejected claim but containing allowable subject matter. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

Claim 136 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the current state of the art, as evidenced by any one of JP 2-182962, JP 5-140849, U.S. Patent No. 6,461,729 to Dugan, and U.S. Patent No. 6,200,669 to Marmon et al., in view of U.S. Patent No. 5,790,926 to Mizoe et al., U.S. Patent No. 3,928,958 to Kurata et al. and U.S. Patent No. 4,369,156 to Mathes et al. Claim 136 further stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizoe et al. in view of the current state of the art, as evidenced by any one of the previous cited patents, and further in view of Kurata et al. and Mathes et al. Claims 1, 2, 6-14 and 16-21 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of references cited above for claim 136 and further in view of U.S. Patent No. 6,063,717 to Ishiyama et al. and U.S. Patent No. 4,931,355 to Radwanski et al. These rejections of the claims are respectfully traversed based upon the following remarks.

Independent claim 1 recites a method of forming a spunbond fabric from a process employing fiber splitting in-line with fiber extrusion, including the steps of extruding an array of plural-component fibers, each including first and second materials having a relative difference in heat shrinkage of at least about ten percent, depositing the array of plural-component fibers onto a moving surface to form a web, applying heat to the web while the web is moving in-line with the extruding and depositing steps and at a speed of from 30 meters per minute to 600 meters per minute to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials, and processing the web to form a nonwoven fabric. Claim 1 further recites that the application of heat is at least one of hot air, steam, and radiant heat.

Similarly, independent claim 136 recites a method of forming a spunbond fabric from a process employing fiber splitting in-line with fiber extrusion, including the steps of extruding an array of plural-component fibers, each comprising first and second materials having a relative difference in heat shrinkage of at least about ten percent, depositing the array of plural-component fibers onto a moving surface to form a web, applying heat to the web while the web is moving in-line with the extruding and depositing steps to cause separation between segments of the plural-component fibers comprising the first material and segments of the plural-component fibers comprising the second material due to differential heat shrinkage of the first and second materials, and processing the web to form a nonwoven fabric. It is respectfully submitted that no combination of the cited references renders obvious the combined features of claim 1 and claim 136.

Applicant initially notes that Dugan, cited as one of the "current state of the art" references, is <u>not</u> a prior art reference with respect to the present application. Applicant's priority date of October 9, 1997 precedes the earliest priority date of Dugan (August 10, 1999). Accordingly, Dugan should be removed from the rejections made by the Examiner.

A number of the references applied by the Examiner in the outstanding Office Action have been discussed in length in remarks to prior office actions for the subject application, and the previous remarks with respect to why none of these references anticipates or renders obvious the claimed features, when utilized alone or in combination with any of the other previously cited references, are incorporated herein by reference.

In this present rejection of the claims, yet another basis for rejection has been employed to reject the claims. In particular, in a first rejection of claims 1 and 136 (e.g., as set forth in paragraph 2 of the outstanding Office Action), the Examiner utilizes the "current state of the art" patent documents as primary references to show that it is known to utilize hydroentangling in-line in a spunbond process to split multicomponent fibers. The Examiner then asserts that it would have been obvious to modify an in-line hydroentangling process to instead heat treat the fibers in-line (e.g., by hot air, steam or radiant heat), where the fibers include materials having a relative difference in heat shrinkage as recited in the claims, based upon the combination of the remaining references that generally teach splitting of multicomponent fibers (although <u>not</u> in-line) utilizing heat. In short, the Examiner's position is that it would have been obvious to replace hydroentangling with heat splitting in an in-line process. The Examiner asserts this

substitution step is obvious because there is a self-evident advantage of obviating the need to provide and collect water used in the hydroentangling as well obviating the need to dry the hydroentangled web.

In the second rejection of claims 1 and 136 (e.g., as set forth in paragraph 3 of the outstanding Office Action), the Examiner changes the rationale of the previous argument by instead starting with one of the references that generally describes heat treating fibers to induce splitting (although not in-line) as the primary reference. In particular, the Examiner utilizes Mizoe et al. as the primary reference which, as has already been discussed in previously filed remarks, generally describes forming split fibers for use in a charging member for an electrophotographic apparatus, where the fibers are stretched and heated to cause splitting. It has also been pointed out in previous remarks that there is no disclosure in Mizoe et al. that the fibers are split in an in-line process. However, while acknowledging this, the Examiner combines Mizoe et al. with Kurata et al., Mathes et al. and any one of the "current state of the art" references to assert that it would have been obvious to employ heat in-line to split multicomponent fibers having a relative difference in heat shrinkage as recited in the claims merely because it is known to perform hydroentangling in-line to split multicomponent fibers. The Examiner asserts that such combination is obvious because the heat splitting of fibers, as taught in Mizoe et al., is an effective alternative to splitting multicomponent fibers by either high pressure water jetting or needling operations.

In both rationales employed by the Examiner to reject the claims (as described in paragraphs 2 and 3 of the outstanding Office Action), the Examiner is in essence rejecting the claims based upon the assertion that a spunbond system that employs in-line hydroentangling to split fibers is readily substitutable with utilizing in-line heat treatment simply because it is generally known in the art that heat can be used to split multicomponent fibers, albeit not in an in-line context. Applicant respectfully disagrees with the combination of references in this manner and submits that, contrary to the Examiner's assertion, hydroentangling is not readily substitutable with in-line heat splitting to render obvious the claimed subject matter.

With regard to the "current state of the art" references, Applicant acknowledges that each of these references teaches splitting of conjugate filaments or multicomponent fibers by air jets or water jets known as hydroentangling. However, this does not in and of itself immediately suggest that any splitting technique, whether in-line or not, may be readily substituted with in-

line hydroentangling to achieve the same or similar end result. In fact, if heat treatment could be readily substituted with in-line hydroentangling, as the Examiner asserts, it would seem likely that there would be a host of prior art documents in existence which show that which the Examiner believes is obvious. Yet, as can be seen from the Examiner's combination of multiple references in an attempt to reject the claimed subject matter, this is clearly not the case.

As Applicant has repeatedly pointed out in previous remarks, the claimed invention is not a matter of simply applying heat to a multicomponent fiber to achieve effective splitting of the fiber in an in-line context. Rather, the process involves the careful selection of different materials that have sufficient relative differences in heat shrinkage, preferably at least about 10 percent, to ensure that the fibers will sufficiently split when moving and being subjected to heat at suitable in-line operating speeds.

However, even assuming that the selection of different polymer materials having sufficient heat shrinkage differentials to induce splitting upon being subjected to heat is obvious based upon the combination of Mizoe et al. with Kurata et al. and Mathes et al., there is still no reasonable combination of any of these references with the "current state of the art" references that would reasonably suggest to one having ordinary skill in the art to substitute an in-line hydroentangling processing step with an in-line heat treatment step so as to effect splitting of multicomponent fibers. This is because hydroentangling is a different process and yields a different product in comparison to mere heat treatment.

To show the differences between hydroentangling and mere heat treatment and why these two processing steps are not interchangeable or readily substitutable, evidence is submitted herewith in the form of a declaration by John F. Hagewood. As the declaration indicates, Mr. Hagewood has extensive experience in the polymer fiber production and textile industry and is well aware of the level of one having ordinary skill in the field of nonwoven synthetic fiber production. In particular, the declaration indicates that multicomponent fibers that are split by mere heat treatment and are subsequently utilized to form a fabric results in a very soft and "buttery" feel for the resultant fabric formed from these fibers. In addition, the heat splitting process, by itself, is not a bonding process. Typically, some other additional processing step, e.g., calender or some other type of bonding technique, is required to consolidate and give the spunbond fabric sufficient structural integrity. Further, this process results in a flat, sheet-like fabric product that includes fibers that are primarily parallel with the surface of the fabric.

In contrast, the declaration indicates that, when utilizing the same multicomponent fibers to form a spunbond web that is then subjected to a hydroentangling process, the resultant spunbond fabric that is formed will have a very different tactile feel in comparison to the spunbond fabric that has been subjected to heat treatment and fiber splitting followed by processing such as bonding. This is due to the fiber segments being split by the action of high pressure water jets in a generally perpendicular direction to the fabric surface. When the fiber segments are split by high water jet action in hydroentangling, many segments are broken and driven into the Z directions of the fabric, resulting in a consolidated fabric that does not require bonding. The hydroentangled resultant fabric has a soft tactile feel, but is also much duller and not as shiny as a fabric formed by heat split fibers as described above.

Thus, a spunbond fabric formed utilizing a hydroentangling technique to split fibers in the fabric yields a much different product than a spunbond fabric that employs an in-line heat treatment step to split fibers as described and claimed in the subject application.

Accordingly, and as supported by Mr. Hagewood's opinion in the accompanying declaration, heat splitting of fibers and hydroentangling of fibers simply are not equivalent, do not accomplish the same process and end result, and are thus not interchangeable with each other. Therefore, it is improper to assert that it would have been obvious to substitute an in-line hydroentangling technique in a spunbond fabric formation process with an in-line heat treatment and fiber splitting technique in a spunbond fabric formation process as described and claimed in the subject application.

Further, Applicant submits that it is does not appear as though any of the "current state of the art" references could be readily modified as the Examiner suggests to replace in-line hydroentangling with in-line heat treatment without destroying the intended purpose and resultant product of each reference. For example, Marmon et al. describes the formation of entangled nonwoven fabrics in which hydroentangling appears to be an intended and essential processing step to achieve the resultant product, which includes not only separated but sufficiently entangled fibers (see, e.g., Col. 10, lines 5-10, and Col. 11, line 10 to Col. 12, line 47 of Marmon et al.). If one were to substitute heat treatment for the hydroentangling step of Marmon et al., there would likely be insufficient entangling of fibers, thus rendering a different product from what was intended in the disclosed process of Marmon et al. In addition, substituting in-line heat treatment for hydroentangling in either of the cited Japenese patent

documents may have the same or similar effect of modifying or destroying the resultant product features that would otherwise be achieved as a result of the hydroentangling step.

Accordingly, claims 1 and 136 should be allowed over any combination of the "current state of the art" patent documents, Mizoe et al., Kurata et al., Mathes et al., Ishiyama et al. and/or Radwanski et al., and the Examiner is requested to withdraw the rejections of these claims.

Claims 2 and 6-21 depend, either directly or indirectly, from claim 1. Accordingly, these claims should also be allowed based upon the previous remarks.

In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1, 2, 6-21 and 136. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

Filed concurrently herewith is a Petition (with payment) for an extension of time for one month to respond to the outstanding Office Action. A Request for Continued Examination is also being filed concurrently with this Response.

Applicant hereby petitions for any additional extension of time that may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,

Andrew J. Aldag

Andrew J. Aldag
Registration No. 40,483

EDELL, SHAPIRO & FINNAN, LLC
1901 Research Boulevard, Suite 400
Rockville, Maryland 20850-3164
(301) 424-3640

Hand-Delivered: June 24, 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Appl. No.	:	09/529,391
Applicant	:	Jeffrey S. Haggard et al.
Filed	:	June 6, 2000
TC/A.U.	:	1733
Examiner	:	Yao, S.
Confirmation No.	:	7035
Docket No.	:	0818.0014C
Customer No.	:	27896
Title	:	METHOD AND APPARATUS FOR IN-LINE SPLITTING OF PLURAL COMPONENT FIBERS AND FORMATION OF NONWOVEN FABRICS

DECLARATION UNDER 37 C.F.R. § 1.132

Mail Stop Fee Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Sir:

John F. Hagewood declares that:

1. I received a Bachelor of Science degree in Mechanical Engineering from Tennessee Technical University in 1965, and Master and PhD degrees in Mechanical Engineering in 1972 and 1974 from Louisiana State University.

2. I have over thirty years of technical experience in the polymer fiber production and textile industry, in which I have been employed in engineering, managerial and sales positions for a number of companies involved in textile fiber production including DuPont, McCoy-Ellison, Inc., Fiber Associates, Allied Engineering, Inc., and Hills, Inc. My work experience includes product development and marketing of new spunbond products and spunbond systems for a wide range of applications. I have been employed with Hills, Inc. from 1997 to present as a Business Unit Director and Business Development Manager, in which my responsibilities include marketing and coordination of sales efforts for Hills, Inc. as well as technology development for solvent spinning of polymer fibers. As a consequence of working closely with engineers and

scientists throughout my professional career, I am well aware of the level of one having ordinary skill in the art in polymer science technologies in general and in nonwoven synthetic fiber production in particular.

3. I am familiar with the in-line fiber splitting process described in the subject U.S. patent application and pending claims, and with the outstanding Office Action, and rejections cited therein, relating to the subject application and dated February 26, 2004. I am also familiar with the following U.S. patent references cited in the Office Action: Japanese Document No. JP 2-182962, Japanese Document No. JP 5-140849, U.S. Patent No. 6,461,729 and U.S. Patent No. 6,200,669, all of which disclose the production of a non-woven web of fibers including a hydroentangling step (hereinafter referred to as "the hydroentangling patent documents"), U.S. Patent No. 5,790,926 to Mizoe et al. (hereinafter referred to as "Mizoe"), U.S. Patent No. 3,928,958 to Kurata et al. (hereinafter referred to as "Kurata"), U.S. Patent No. 4,369,156 to Mathes et al. (hereinafter referred to as "Mathes"), U.S. Patent No. 6,063,717 to Ishiyama et al. (hereinafter referred to as "Ishiyama"), and U.S. Patent No. 4,931,355 to Radwanski et al. (hereinafter referred to as "Radwanski").

4. To the best of my knowledge, only two techniques are both fast enough and economically feasible to be utilized in an in-line spunbond process to split fibers into two or more components. The first technique is hydroentangling, and the second technique is the heat shrinkage process to induce splitting based upon the heat shrinkage differential of polymer components utilized as described and claimed in the subject application. It is my opinion that these two techniques are so different from each other in function and outcome (i.e., in producing the resultant product formed) that one having ordinary skill in the art of spunbond fabric production would not be motivated to exchange one technique for the other. The differences between these two techniques are set forth in the following two paragraphs.

5. When a plural component fiber is split by heat treatment, as in the process described in the subject application, the different polymer segments react to the heat differently due to their differences in heat shrinkage. If the heat shrinkage between the different polymer segments is sufficient, as described in the subject application, the fiber will split along the interface between the segments, with longer segments (i.e., segments that have shrunk to a lesser degree than other segments) curling and looping around other segments. This results in a very soft and "buttery" feel for the resultant fabric formed

from these fibers. In addition, the heat splitting process, by itself, is not a bonding process. Typically, some other additional processing step, e.g., calender or some other type of bonding technique, is required to consolidate and give the spunbond fabric sufficient structural integrity. Further, this process results in a flat, sheet-like fabric product that includes fibers that are primarily parallel with the surface of the fabric.

6. In contrast, when utilizing the same plural component fibers to form a spunbond web that is then subjected to a hydroentangling process, the resultant spunbond fabric that is formed will have a very different tactile feel in comparison to the spunbond fabric that has been subjected to in-line heat treatment and fiber splitting followed by processing such as bonding. This is due to the fiber segments being split by the action of high pressure water jets in a generally perpendicular direction to the fabric surface. When the fiber segments are split by high water jet action in hydroentangling, many segments are broken and driven into the Z directions of the fabric, resulting in a consolidated fabric that does not require bonding. The hydroentangled resultant fabric has a soft tactile feel, but is also much duller and not as shiny as a fabric formed by heat split fibers as described above in paragraph 5. Thus, a spunbond fabric formed utilizing a hydroentangling technique to split fibers in the fabric yields a much different product than a spunbond fabric that employs an in-line heat treatment step to split fibers as described and claimed in the subject application.

7. It is therefore my opinion that an in-line hydroentangling technique in a spunbond fabric formation process is not interchangeable with an in-line heat treatment and fiber splitting technique in a spunbond fabric formation process as described and claimed in the subject application. While both techniques achieve splitting of fiber segments, both techniques also achieve a significantly different spunbond fabric.

8. Accordingly, based upon my extensive experience in the field of nonwoven polymer fiber production, it is my opinion that it would not have been obvious to persons having ordinary skill in the nonwoven fiber production art to combine any of the methods described in the hydroentangling patent documents with any one or more of Kurata, Mathes, Ishiyama and/or Radwanski so as to achieve the in-line splitting method as described and claimed in the subject application.

9. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and

further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: 6/21/04

By: [signature]
John F. Hagewood